

FINAL REPORT

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

GRANT NUMBER NSG-615

by:

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Facility Form 602

N67 18989	(ACCESSION NUMBER)	(THRU)	(CATEGORY)
10 7 22-26			
2CR-82481 END	(PAGES)		
	(NASA CR OR TMX OR AD NUMBER)		

UNIVERSITY OF MARYLAND
DEPARTMENT OF PHYSICS AND ASTRONOMY
COLLEGE PARK, MARYLAND

Technical Work

The original period of this grant was October 1, 1965 to September 30, 1966. However, the tenure of the grant was extended and work continued under it until November 30, 1966. This report will cover primarily the work carried out since the last status report, namely during the summer and fall of 1966. This grant supports a portion of the work at the University of Maryland's Clark Lake Radio Observatory. It enables us to extend our program into fields which we would otherwise be forced to neglect. These are fields of particular interest to the staff of the Goddard Space Flight Center, and the program are undertaken into close cooperation with that institution. The programs include solar and planetary observations with the decametric array at Clark Lake, the construction and operation of an array of log periodic antennas for solar observations in the 20 to 60 MHz region, and the installation and operation of a Jupiter monitoring station at Clark Lake.

The University of Maryland completed the construction of a new building at the Clark Lake Radio Observatory in June, 1966. This facility multiplied our laboratory space by a factor of about six and gives us comfortable air conditioned quarters in which to work.

Most of July and August were spent in re-organizing our electronic equipment and installing it in this new building. The receivers for the Clark Lake Array were mated to a new digital output system and installed in the laboratory. In addition, the Jupiter station receivers and the receiving equipment for the log periodic array has been installed. A set of 8 fixed-frequency total-power receivers for use with the log

periodic array are available. However, critical portions of a sweep frequency system to be used with that antenna have not yet been delivered.

The log periodic array consists of 16 equatorially mounted log periodic elements. These elements are placed at 220 m intervals along a 2 mile E-W baseline. During the summer, the log periodic antenna were assembled and erected at the site. Several difficulties arose during the erection of these antennas. The most serious difficulty encountered was that a junction in the polar axis of each mount was found to be structurally unsound. Also, a number of modifications to the declination drives were required in order to make them operate properly. These difficulties were overcome and all of the antennas are now in proper working order. The power and control cabling for the array has been laid in its ditches but electrical hook-up of the control and drive systems has not yet been completed. Since the array stretches over a two mile baseline, a fairly complex control system is required to drive all of the antennas synchronously. Control boxes to be placed at each antenna will soon be delivered. The electrical hook-up of the drive systems can then be completed. Construction of the radio frequency feed system is about half complete. Completion of this portion of the system will probably be governed by the delivery of antenna pre-amplifiers. We expect to make the first tests of the whole system and initial observations in April, 1967.

Travel

Dr. Erickson has been elected U. S. National Chairman of Commission V (Radio and Radar Astronomy) of the International Scientific Radio Union. As a U. S. Delegate he therefore attended the Fifteenth General Assembly

of this union which was held in Munich Germany during September, 1966. Funding for this trip was provided jointly by this grant and the University of Maryland. Dr. Erickson, with the assistance of the other delegates, prepared the official report concerning the assembly which was forwarded to the U. S. National Academy of Sciences in December, 1966.

Scientific Work

During the period of this grant the decametric array at Clark Lake has been devoted primarily to the completion of a large scale sky survey under NSF sponsorship. Solar activity increased to the point where observation of the sun would have been profitable during the summer of 1966. Unfortunately, we were out of operation during the most interesting periods of solar activity due to the move into our new building. Decametric radiation from the planet Jupiter was observed during the period when that planet was in conjunction with the radio source Taurus A. These observations resulted in the paper "The Absolute Position of the Jovian Decametric Source" by T. A. Clark, NASA Marshall Space Flight Center, Huntsville, Alabama and J. K. Alexander, NASA Goddard Space Flight Center, Greenbelt, Maryland. This paper was presented to the American Astronomical Society in December, 1966. During October and December, 1966 we also engaged in a series of interplanetary scintillation observations. These scintillations are caused by inhomogeneities in the solar wind which produce a diffraction pattern in the radio radiation falling on the earth. This diffraction pattern is swept across the earth due to the solar wind velocity and the earth's orbital motion. The scintillations are produced only by radio sources of small angular size and form a useful tool for a study of small angular diameter sources and for a study of the solar wind.

We proved that these scintillations can easily be observed with the Clark Lake Antenna. We can apparently observe the Scintillations for radio sources in all parts of the sky, except for a small region about 30 degrees wide in the anti-solar direction. Now that our sky survey work has been completed, we are embarking upon an ambitious program of scintillation observations. This program is motivated primarily by a desire to study the solar wind, rather than radio source structure. However, it should yield both types of data.

Most of our effort during this year has been engaged in equipment construction rather than scientific research. However, there papers based on our previous work have been formally published during the year. Copies of these papers are enclosed. In addition, papers were presented at meetings of the American Astronomical Society. They were entitled:

(1) "The Absolute Position of the Jovian Decametric Radio Source",
T. A. Clark and J. K. Alexander, 123rd Meeting of A.A.S. at Los Angeles,
California, December, 1966.

(2) "Interplanetary Scintillations at Decametric Wavelengths from a
Small Source in the Crab Nebula", Harriet H. Malitson and Robert G.
Stone, NASA Goddard Space Flight Center, and William C. Erickson,
University of Maryland, 121st Meeting of A.A.S. at Hampton, Virginia,
March, 1966.

Personnel

Mr. Max Komesaroff completed his two year visit to the University of Maryland in May, 1966. He then returned to his permanent position

at the Radiophysics Laboratory, C.S.I.R.O., Sydney, Australia.

Mr. John Hubbard, who has been working on this project for many years, moved to California where he is now engineer-in-charge of operations at the Clark Lake Radio Observatory.

Mr. Robert Meiers was hired as an observer in September, 1966.